

ZONOLITE

BRAND

VERMICULITE

insulation

lightweight
aggregates

acoustical
materials



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ZONOLITE

TRADE MARK REG. U. S. PAT. OFF.

VERMICULITE

what it is . . .

An amazing mineral discovered during World War I, Zonolite brand vermiculite has been developed into a new industry that is on the threshold of revolutionizing building.

A Feather-weight mineral that can be used by itself, or mixed as an aggregate with gypsum or portland cement, Zonolite vermiculite makes possible the elimination of tremendous dead load in buildings, at the same time greatly increasing fire safety. Zonolite cannot possibly be burned. It is processed at 2000°.

Zonolite vermiculite is a member of the mica family, but unlike ordinary mica, it will expand when heated. It is this ability to expand when heated that makes Zonolite unique. The expanded material weighs from 5 to 10 pounds per cubic foot, and contains millions of tiny dead air cells that are natural insulators against the passage of heat. In addition, Zonolite has many glittering surfaces which reflect heat, giving it dual insulating value.



outstanding characteristics

efficiency—Insulates against conducted, convected and radiant heat, the same insulation used to ship red hot steel ingots, at little loss in temperature.

permanent—Inorganic, sterile, will not rot or decompose. Moisture does not harm Zonolite. Even if accidentally wetted, it regains its original efficiency when dried out.

lightweight—Only 5 to 10 pounds per cubic foot, depending on the grade.

fireproof—The most fire safe material available for building. Fusion point is 2560°.

rotproof, verminproof—No rats, termites or other pests can harm Zonolite vermiculite.

economical—Gives many added benefits, yet often costs less than material it replaces.

sound-deadening—Millions of tiny dead air cells trap unwanted noise.

uses of Zonolite

as a Fill Type Insulation—

A lightweight, free-flowing material, usually installed between attic joists and in side wall studs. Fills every space uniformly to the proper density without seams or joints. Simply pour from the bag and level off to even thickness. 100% fireproof—not treated—can't possibly burn. In case of high humidities or unusual moisture conditions, material will not be harmed or lose original characteristics.

as an Insulating Concrete Aggregate—

Replaces sand or gravel in concrete. Mixes in the same manner as ordinary concrete. The aggregate is treated chemically at time of manufacture to improve workability, bulk and lightness of the concrete. Zonolite Insulating Concrete has a high insulating value, one inch having a rate of heat transfer equal to 12 to 16 inches of ordinary concrete. The principal uses are for insulating floors, in fill-type roofs, for structural insulating roof decks, and for filling cavity tile walls.

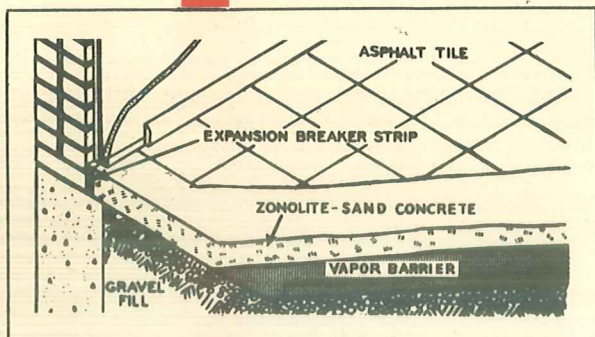
as a Lightweight Plaster Aggregate—

Weights only 8 pounds per cubic foot, compared to 100 pounds for sand. Rapidly replacing sand in gypsum plaster. Used in the same manner and proportions (volume) as sand. Ease of handling and elimination of dead load usually makes cost of Zonolite Plaster at least as favorable as sand plaster. Resilient but tough. Up to 4 times the fire safety of ordinary plaster. Also available: Zonolite Vermiculite Finish Aggregate, a special product for plaster finish coats.

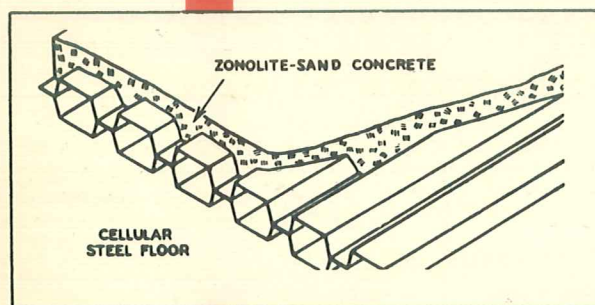
as an Acoustical Plastic—

A factory mixed material requiring only the addition of water before being applied by ordinary plastering procedures. Incombustible, low cost, sound-deadening, sticks to any clean, firm, water-resistant surface. Applied to combustible surfaces, it reduces flame spread, contribution of fuel and production of smoke.

An 80 lb. Insulating Structural Concrete That Requires No Topping



Floors on ground



Floor above ground

- FOR STRUCTURAL STEEL FLOORS
- FOR REINFORCED CONCRETE FLOORS
- FOR FLOORS ON THE GROUND

Field and laboratory tests have proved that the new Zonolite-sand cement mix is the answer to the engineer's needs for a lightweight, strong, insulating floor concrete.

The new mix results in considerable reduction of dead weight which may substantially reduce structural steel requirements for floors above ground. For floors on the ground it provides up to four times the insulation protection of ordinary concrete. Floor temperature thus remains close to room temperature which greatly reduces any possibility of moisture condensation. Heat loss into the ground is minimized.

Zonolite-sand concrete also has resilience approaching that of wood floors, as a special topping of hard concrete is not required. A wearing surface of asphalt tile, ceramic tile, carpeting or other flooring material is recommended.

PHYSICAL CHARACTERISTICS OF 1:3:2 MIX*

*1 cu. ft. Portland cement—1 bag; 3 cu. ft. stabilized Zonolite concrete aggregate— $\frac{3}{4}$ bag; and 2 cu. ft. sand.

Compressive strength	620 p.s.i.
Indentation strength	1412 p.s.i.
Unit weight	80 lbs. per cu. ft.
Expected yield	4.4 cu. ft.
Cement factor (number of sacks of cement for 1 cu. yd. of concrete).....	6.2 sacks

Averages for tests by Robert W. Hunt Co., Chicago



Quarry tile laid over Zonolite-sand concrete at Ford Plant.

Solves Problem for Ford Motor Co.

Zonolite-sand concrete was found to be the answer to a recent problem confronting the Ford Motor Company construction engineers. The floor of their giant, new dynamometer plant at Dearborn, Michigan (note photo), required a 4-inch fill: Density to be not greater than 80 pounds per cubic foot—compressive strength to be at least 400 pounds per square inch.

The specifications were easily met by the new Zonolite-sand structural concrete which weighs approximately one-half as much as ordinary concrete and withstands compressions up to 620 lbs. per sq. in.

SEE OTHER SIDE FOR SPECIFICATIONS

ZONOLITE-SAND CONCRETE FLOORS

STRUCTURAL FLOORS:

The construction shall consist of steel flooring (e.g. Robertson Q. floor, Corruform, etc.) or reinforced concrete floors of required section and strength to carry the dead and live loads for the spans shown on the drawings.

BASE PREPARATION FOR GROUND FLOORS:

The base shall be well drained, reasonably level, and sufficiently stable to support the superimposed loads without settlement. Generally, a fill of five or six inches of coarse stone or gravel is desirable to stop the capillary rise of water from the ground. This should be thoroughly rolled and tamped to prevent settling. Zonolite-sand concrete may be poured over new or existing structural bases that are clean and in sound condition. Over wood floors it is necessary to lay waterproof paper before pouring the Zonolite-sand concrete to prevent swelling and warping of the wood from the water in the concrete.

A moisture barrier is desirable under grade level floors. One should always be used if floor covering is an organic material such as linoleum, asphalt tile, carpeting, etc. A suitable barrier consists of one or more saturated and coated felts with joints lapped and sealed. Generally, the moisture barrier is applied under the insulation. Although the barrier can be applied directly on top of the stone fill, it is suggested that the fill first be prepared by spreading a weak mix of concrete or a dry mixture of sand and cement lightly over the surface in order to close the surface voids. This is wet with a light spray to add sufficient water to hydrate and set the cement. After this is set sufficiently, the surface is swept clean and the moisture barrier is applied as specified.

Note to Engineer: Over these bases shall be placed Zonolite-sand concrete to provide a base for tile (ceramic or composition), linoleum, carpeting or terrazzo finish. *The minimum thickness of Zonolite-sand concrete shall be 2" for structural floors and 4" for floors on the ground.*

MATERIALS:

The Zonolite-sand concrete mix shall consist of stabilized Zonolite concrete aggregate, sand, Portland cement and water.

SAND . . . shall be clean, well graded and free from organic material. It shall conform to ASTM designation C-33 (Standard Specifications for Concrete Aggregates).

PORTLAND CEMENT . . . shall conform to ASTM designation C-150 (Standard Specifications for Portland Cement) and shall be Type I, II, or III.

WATER . . . shall be clean and free from harmful amounts of acids, alkalis or organic materials.

MIX:

The proportions of the mix shall be 1 cu. ft. Portland cement (1 bag), 3 cu. ft. stabilized Zonolite concrete aggregate ($\frac{3}{4}$ bag), and 2 cu. ft. sand. The mix shall be maintained uniform throughout the job. Water shall be added to produce a slump of not less than 3 in. nor more than 5 in.

MIXING:

Shall be accomplished in a mechanical mixer (plaster type with positive paddle agitation preferred, but revolving drum with stationary plates also satisfactory). Sand, cement, and approximately 10 gallons of water per sack of cement shall be mixed for about $\frac{1}{2}$ minute before adding the Zonolite concrete aggregate. After adding Zonolite, the concrete shall be mixed for an additional 2 minutes, adding more water if necessary to obtain the desired slump.

NOTE: When transit-mixed Zonolite-sand concrete is used, the operation shall be as follows:

1. Place all aggregate, cement and water for required batch in the mixer.
2. Only turn drum at plant sufficient to obtain uniform mix.

3. DO NOT TURN DRUM WHILE DRIVING FROM PLANT TO JOB.

4. At job—turn drum for 1 minute—add reserve water from mixer tank if necessary to obtain 3" - 5" slump.

PLACING AND FINISHING:

(a) The Zonolite concrete shall be transported and placed immediately after mixing is completed. No concrete that has hardened or been contaminated by foreign material shall be deposited on the work, nor shall retempered concrete be used.

(b) The Zonolite concrete shall be placed in panels of a width capable of being screeded and finished to desired sections. When construction joints are necessary, they shall be formed by means of vertical bulkheads.

(c) After placing the concrete, it shall be screeded to required level or slope as the case may be, and left without further working of the surface until the concrete is ready for finishing.

(d) Finishing shall consist of steel trowelling to exact level and smoothness to receive tile when specified. Broom finish for terrazzo topping where specified.

SCORING:

The surface shall be scored to approximately $\frac{1}{2}$ " depth from the top surface during the finishing operation. The use of a finishing trowel with a small radius edge is permissible. The scoring should be done so as to form panels not greater than 16 feet in any direction.

REINFORCEMENT:

(Note to Engineer—a welded wire mesh such as 6-6/10-10, while not necessary for structural strength, is desirable for minimizing size of cracks due to temperature changes or shrinkage. It is recommended that such a mesh be used for all important installation.)

CURING AND PROTECTION IN HOT WEATHER:

In hot weather the finished surface of the Zonolite concrete shall be prevented from drying out for not less than three days. This shall be accomplished by use of a layer of building paper. Wax or other curing compounds that would interfere with the tile bond or terrazzo bond shall not be permitted.

COLD WEATHER PROTECTION:

(a) In cold weather adequate protection shall be given the Zonolite concrete to prevent its freezing while placing and setting.

(b) Whenever the temperature of the surrounding air is below 40°F all concrete placed shall have a temperature between 70°F and 80°F.

(c) Protection against freezing shall be maintained for three days after the concrete has been placed.

PROTECTION FROM CONSTRUCTION DAMAGE UNTIL WEARING SURFACE IS APPLIED:

General contractor shall exercise reasonable care to prevent gouging, scuffing or other damage to the Zonolite-sand concrete between the time the concrete is placed and the wearing surface is applied.

CONCRETE TO BE DRY BEFORE COVERING:

No tile (ceramic or composition), linoleum, or carpeting shall be laid over the Zonolite concrete base until the concrete is thoroughly dry. Recommended minimum time to elapse before such application is made shall be three weeks. However, as the rate of drying depends on the temperature and humidity conditions, the minimum drying time should be extended during damp weather.

Zonolite insulation fill type

twin houses prove efficiency—Two houses, designed by Albert Kahn and of the same basic construction, were built side by side in Detroit for test purposes. House A was un-insulated, while House B was insulated completely in attics and sidewalls with Zonolite vermiculite insulation. Throughout one winter both homes were kept at a maximum temperature of 74°. Records show that House B saved an average of 38% of the fuel bill every month during the heating season. At today's fuel costs, House B saved \$119.75 every year, quickly paying for the insulation. House B was more comfortable, healthful, and cleaner. There were no annoying drafts or temperature differences.

installation—Zonolite Insulating Fill is packed in 4-cubic-foot bags weighing approximately 20 lbs. It is merely poured from the bag and leveled to the desired thickness. In sidewalls, Zonolite fills to a uniform density, flowing evenly around nails, braces, plaster keying, conduit or other obstructions, leaving no voids or seams to leak heat. No special tools or equipment are needed. Anyone can install Zonolite.

insulates the entire home in two hours—Robert Stoneall, Sioux Falls, S. D. contractor, has used Zonolite insulation exclusively for 15 years, in attics and sidewalls of his homes. In two hours two of his men insulate a 24' x 30' home, from unloading of the insulation to burning the bags. The insulation job may be done either before or after plastering. Here's how:

1. Bags are placed around stud channel openings in the attic. (The 2" x 4" plate is placed on top of ceiling joists instead of below.) Then Zonolite is merely dumped between sidewall studs till the walls are filled. Walls are tamped lightly with a rubber mallet or 2" x 4" as the insulation is poured, to settle granules in place.
2. Additional bags are emptied in center of the attic, and Zonolite is leveled between joists with a piece of notched wood or cardboard serving as a screed.
3. Under window openings, Zonolite is installed as the lath is applied.

This same procedure can be followed in commercial and industrial buildings as well. Zonolite Fill Insulation has been installed in skyscrapers like the Field Building in Chicago, as well as many schools, churches, cold storage plants, and other type buildings.



Installing Zonolite vermiculite in unfloored attic

The chart below shows the approximate area covered by one bag of Zonolite Granular Fill Insulation when installed at various thicknesses.

Thickness	2"	3"	3½"	4"	5"	5½"
Coverage per bag in sq. ft.	26	17	14	13	10½	9

settlement test—In a recent test on the settlement of Zonolite, a steel cylinder 15" long and 5" in diameter was filled with Zonolite. A disc 1" thick that would slide freely through the cylinder was placed on top of the Zonolite. This disc was subsequently loaded to 84 lbs. and a total compression of 6/32" was observed. When the weights were removed the Zonolite recovered to within 1/32" of the position before the weights were applied. This simple test proves the amazing resistance of Zonolite to settlement, and indicates a desirable resilient characteristic.

plus values in Zonolite—Remember the features that make Zonolite a preferred insulation. It's fireproof, rotproof, verminproof. It's easily installed, lasts a lifetime. Available at lumber and building material dealers throughout the country.

For Further Information, Write for Folder HI-20.



Installing Zonolite in floored attic



Pouring Zonolite Fill Insulation in sidewalls

general characteristics of Zonolite insulating concrete

Zonolite Insulating Concrete is made by mixing Zonolite Stabilized Concrete Aggregate, a special grade of vermiculite, with portland cement and water. It is mixed in the same manner as ordinary concrete. The aggregate is treated chemically at time of manufacture to improve workability, bulk and lightness of the concrete, and at the same time impart considerable water repellency to the product.

Zonolite Insulating Concrete has a high insulating value, one inch having a rate of heat transfer equal to 12 to 16 inches of ordinary concrete. It has sufficient crushing strength (from 5 to 16 tons per sq. ft., depending on the mix) to withstand all but the most unusual load conditions. The principal uses are for insulating floors and fill type roofs, for structural insulating roof decks, and for filling cavity tile walls.

floor insulation

Zonolite concrete in floors is used two ways: (1) mixed as above, for insulating floor slabs requiring a topping of ordinary concrete for wearing surface; and (2) Zonolite Floor Concrete, consisting of portland cement, Zonolite Aggregate, and sand.

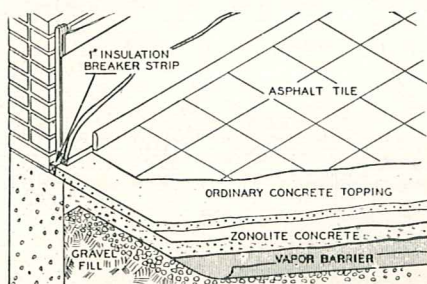
Zonolite insulating concrete is used largely as a floor laid right on the ground, to provide warmth and dryness. The danger of condensation, which forms when warm air passes over a cold surface, is minimized with Zonolite concrete. Heat loss into the ground is prevented. The recommended mix for insulating concrete is 1:6—one cu. ft. of portland cement to 6 cu ft. of Zonolite Stabilized Concrete Aggregate. The minimum recommended thickness for the Zonolite floor slab is 3".

As a base for radiant panel floor systems, Zonolite affords several distinct advantages. (1) No fuel is wasted heating 5 inches of concrete slab and several feet of ground below. Only a thin top layer of concrete need be heated. (2) Room temperatures respond more rapidly to thermostatic control. Zonolite concrete does not allow reservoirs of heat to be built up in the ground to discharge into the room when not wanted. (3) Lower water temperatures are required to bring desired results, thus saving fuel.

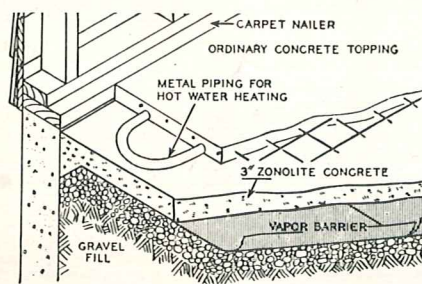
Zonolite insulating concrete is equally suitable for any type of radiant heating system.

Zonolite Floor Concrete (different from Zonolite Insulating Concrete) is recommended where a semi-lightweight concrete is desired, combining properties of insulation and structural strength. It consists of Zonolite Stabilized Concrete Aggregate, portland cement, and sand. The necessity of a topping is eliminated. The compressive strength of the recommended 1:3:2 mix (1 part cement, 3 parts Zonolite Aggregate, 2 parts sand, by volume) is 620 p.s.i., and the weight approximately 80 pounds per cubic foot. Tremendous weight-savings in multiple-story construction are possible where the Zonolite-sand concrete mix is employed as a structural floor or as fill over structural floors.

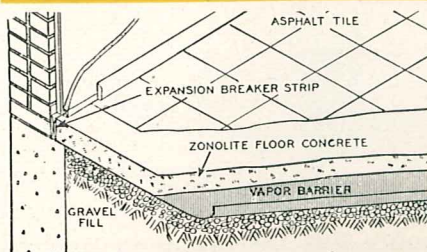
For further information write for folder CA-4.



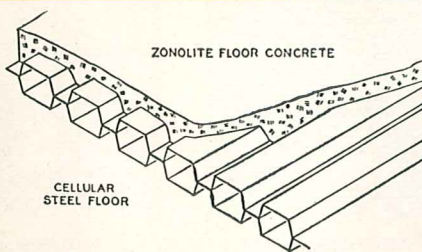
Zonolite concrete on-the-ground.



Insulating concrete under radiant heat coils.



Floor concrete on ground.



Floor concrete over cellular floor.

roof insulation

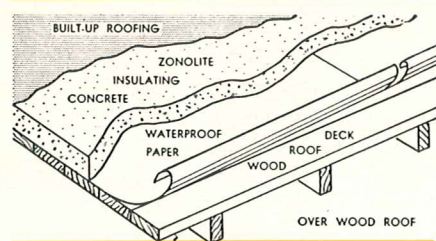
Zonolite Insulating Concrete—because of its lightness, insulating value and permanence—is the ideal material for roof insulation on structural decks of other materials such as concrete, wood, steel, gypsum, etc. It is simply poured to the required depth (never less than two inches) over the existing structural deck and when cured, a built-up roof or other roofing material is applied according to customary practice.

This permanent insulating material has sufficient strength to withstand normal traffic on roofs, combined with flexibility and resiliency to resist cracking due to temperature changes. The chemical pretreatment of the aggregate imparts a considerable degree of water resistance to the concrete.

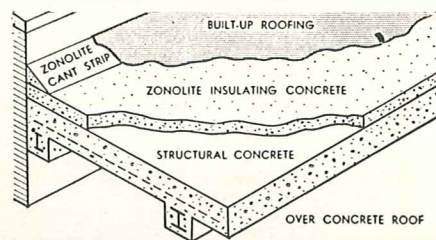
cants, crickets and saddles may be poured monolithically with the roof insulation. By varying the thickness of the Zonolite Concrete, proper slopes for roof drainage can be easily obtained.

Normally a 1:6 mix (1 bag portland cement to 1½ bags of Stabilized Concrete Aggregate) is used.

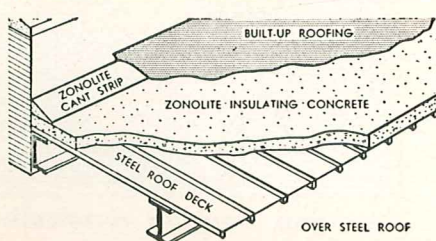
For details and specifications, write for folder CA-2.



OVER WOOD ROOF



OVER CONCRETE ROOF



OVER STEEL ROOF

Zonolite insulating Concrete

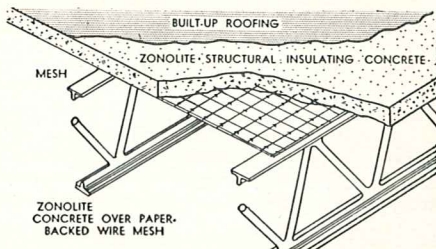
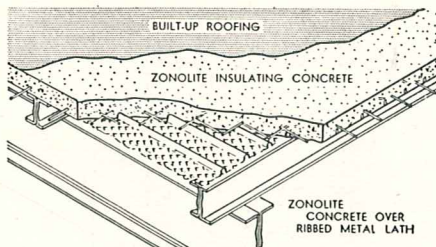
physical properties:

Type	Roof and Floor Insulation	Insulating Structural Roof Deck	Floor Concrete
Mix	1:6	1:4	1:3:2
Portland Cement (Bags)	1	1	1
Zonolite Stabilized Concrete Aggregate (Bags) ..	1 1/2	1	3/4
Sand (U.S. Std. Concrete) Cu. Ft.	—	—	2
Recommended Slump.....	6"-9"	6"-9"	3"-5"
Density (Lbs. per Cu. Ft.)	25	35	80
"K" (BTU/Hr./Sq. Ft./Inch—70° F. Mean Temp.)	0.76	0.97	
Crushing Strength (PSI)	125	325	620
Indentation (PSI)	166	350	1412

structural roof decks

Zonolite Insulating Concrete is widely used in Short Span Structural Roof Decks, in which the functions of insulation and structural strength are combined. Reinforcing steel, usually in the form of a welded wire mesh, is embedded in the insulating concrete. Illustrated are two common types of construction, one using a paper-backed lath called "Steeltex," and the other with hi-rib lath. Supporting forms of gypsum, asbestos cement or fiber board are also frequently used. For this application, the usual proportions are 1 bag (4 cubic feet) of Zonolite Stabilized Concrete Aggregate to 1 bag portland cement.* The thickness recommended varies with the distance between joists centers, but in no case is less than 2" recommended.

*For further information and specifications, write for folder CA-5.



cavity wall insulation

Zonolite Insulating Concrete is finding increasing application as an insulating material in cavity walls constructed of brick, clay, tile or concrete block. Very lean mixes, such as 1-16 having the maximum insulating value, are generally used.

general specifications

1. Materials: The Zonolite Concrete shall consist of Zonolite Stabilized Concrete Aggregate, portland cement, and water—thoroughly and uniformly mixed. In Zonolite floor concrete a concrete sand shall also be used.

The Zonolite aggregate shall weigh between 5 and 10 lbs. per cu. ft. and shall be so graded that at least 95% will pass a No. 3 sieve, and its 100 mesh fines content shall not exceed the ASTM standard specifications for concrete aggregate (C33-49). The Aggregate shall have been chemically treated (Stabilized) in manufacture to prevent segregation, insure uniformity, and reduce capillarity of the concrete, and only material so treated shall be acceptable.

Portland cement shall conform to ASTM standard specifications (C150-49). Sand shall be a U.S. Standard concrete sand; clean, sharp, and free of organic matter and shall conform to ASTM standard specifications (C33-49).

Water shall be of potable quality.

2. Proportioning: The proportions of the above ingredients shall be as specified under Physical Properties. The mix shall be maintained uniform throughout the job. Sufficient water shall be used to produce a slump of 6 to 9 inches.

3. Mixing: For mixing Zonolite Concrete a plaster type mixer with positive paddle agitation is preferred. Any sequence of mixing is satisfactory which results in all of the water and all of the aggregate coming together at one time. In no case shall either be added slowly while mixing continues. The period of mixing shall be approximately four minutes or until complete uniformity and a flowable mixture results. The time of mixing shall be closely adhered to throughout the job. Do not overmix.

When Zonolite concrete is mixed in a transit mixer do not turn the drum while driving from plant to job. Particularly avoid overmixing. A low yield will result from overmixing or delay in placing.

4. Placing and Finishing: The Zonolite Concrete shall be transported and placed immediately after mixing is completed. Under no circumstances, either with or without reworking, shall mixtures be used that have been delayed in placing so that their consistency has changed. Zonolite Insulating Concrete shall be laid to the thickness and slopes conforming to the plans, and shall be finished to the smoothness desired as soon as the consistency is suitable. Rewetting and trowelling of the surface after the surface has set too hard for proper working shall not be allowed.

5. Curing and Protection: The surface of the freshly finished Zonolite Concrete shall be prevented from drying out for not less than three days, or sufficiently long to allow the concrete to develop the desired strength.

The Zonolite Concrete shall be protected from freezing during and after placing until such time as no harm results.

floor insulation

Zonolite Concrete floor insulation (1:6 mix—1 bag cement to 1 1/2 bags of Zonolite Aggregate) shall be placed on a well drained, reasonably level and stable base. Generally a fill of 5-6 inches of coarse stone is desirable to stop the capillary rise of water from the ground.

Zonolite insulating concrete may be poured over new or existing bases that are clean and sound. Over wood floors it is necessary to lay waterproof paper before pouring, to prevent water damage to the wood.

A moisture barrier is required under grade level floors.

A wearing surface must be provided for all Zonolite Insulating Concrete floors to resist abrasion and highly concentrated loads. This wearing surface may be concrete, wood, tile or a combination of these. Where the structural base under the Zonolite Insulating Concrete is a wood floor, or where the base is not absolutely rigid, a concrete wearing surface should be reinforced.

Where radiant heat pipes are laid over Zonolite Insulating Concrete, it is customary to cover the pipes with ordinary concrete to a thickness of one inch over the pipes.

Zonolite floor concrete

Zonolite Floor Concrete shall be mixed, placed, cured, and otherwise handled in the same manner as Zonolite Insulating Concrete. A 1:3:2 mix—1 bag cement to 3 cubic feet of Zonolite Aggregate and 2 cubic feet of sand—mixed by volume, is specified and for ordinary loads requires no topping other than the desired finish floor surface.

roof insulating concrete

Zonolite Concrete roof insulation (1:6 mix—1 bag cement to 1 1/2 bags Zonolite Aggregate) may be placed over any type of structural roof deck capable of supporting loads. When placed over materials subject to excessive expansion and contraction, a slip-sheet of treated paper should be used to prevent bond of the insulation to the deck. Also, when placed over decks capable of excessive flexural movement, the use of light wire reinforcing mesh within the insulating concrete is desirable to distribute the stresses which occur during movement.

Where special conditions of humidity or exacting insulation requirements exist, it is recommended that the job be designed and engineered to meet these conditions.

The built-up roofing shall be applied according to manufacturer's directions. The Zonolite Concrete shall be allowed to dry, following curing, until no frothing or bubbling appears upon application of the hot-mopped bonding coat. The surface of the Zonolite Concrete shall be protected during placing of the roofing from any condition which could seriously mar or loosen the surface.

insulating structural roof decks

The construction shall consist of a structural frame over which is to be placed a reinforced monolithic slab of insulating concrete (1:4 mix—1 bag cement to 1 bag Zonolite Aggregate) to provide a structural roof deck, and a final weatherproof membrane of built-up roofing. The thickness and slope of the Zonolite Concrete shall be as shown on the plans. For spans up to 32 inches ordinarily a 3 inch thickness of (1:4) Zonolite concrete is recommended.

Reinforcing shall be placed over the supporting members as called for in the plans. Forms shall be adequate to prevent leakage of the concrete during placing, and have sufficient supporting power to sustain the load of the concrete until it is set. Where light mesh reinforcement is used, it shall be stretched over the supporting members at each span to prevent excessive sagging. Structural bases or forms having excessive absorption shall be thoroughly wet down before applying the Zonolite Concrete.

Zonolite vermiculite plaster

Zonolite Vermiculite Plaster Aggregate—weighing only 8 pounds per cubic foot, as compared to 100 pounds for sand—is rapidly replacing sand in gypsum plaster. It is graded to the standard sizes specified for sand aggregates and is included in the Standard Specifications for Gypsum Plastering, as sponsored by the A.I.A. and the A.S.T.M.

Zonolite plaster affords many advantages:

a standard, uniform material—meets rigid specifications—Zonolite is the same wherever purchased—Maine, Florida, California or in any of the other states. Regularly inspected by Underwriters' Re-examination service.

lightweight—Zonolite Plaster Aggregate weighs about 216 lbs. per cubic yard. An equal volume of sand weighs 2700 lbs.—over ten times as much. The use of Zonolite aggregate in plaster eliminates tons of weight. Lightness reduces settlement, a principal cause of cracking.

chip-proof—will not chip when nails are driven into it.

firesafe—Zonolite Plaster offers as much as four times the fire protection of ordinary plaster, reducing the spread of heat and flames when fire occurs.

insulating—Zonolite vermiculite plaster has about $3\frac{1}{2}$ times more insulating value than ordinary plaster. It supplies additional insulation at vital points on walls and ceilings, to minimize possibility of condensation.

easy to apply —

Lightweight Zonolite plaster can be applied with astounding ease and with few droppings. In remodeling, there is no danger of scratching floor surfaces — Zonolite plaster is not abrasive. Saves hours in preparation and clean-up.

sound-conditioning

—plastered walls provide superior sound-absorption.

Zonolite finish aggregate

—Recently introduced after 3 years of field testing, Zonolite Finish Aggregate now enables plasterers to use lightweight Zonolite Aggregate from "scratch to finish." For complete information, send for folder PA-9.

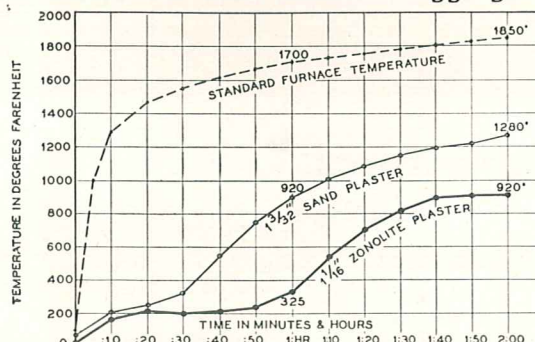


Caption: (1) Zonolite Aggregate saves time in getting ready for the job—easily hauled and handled. (2) Can be mixed indoors, no freezing.



Zonolite vermiculite

Heat Transmission through Gypsum Plaster with Sand and with Zonolite Aggregate



Partial Summary of Fire Tests

Construction	Description	Rating	Authority
	Steel Plate Floor Assembly. 2" vermiculite concrete topping. Suspended ceiling 1" vermiculite plaster on metal lath.	4 hrs.	Underwriters' Lab. Ret. No. 2773-9/12/44
	Steel Plate Floor. Suspended ceiling of 1" vermiculite plaster, on metal lath as protection for steel construction. Incombustible construction above ceiling.	4 hrs.	Underwriters' Lab. Ret. No. 2773-1/20/47
	Steel Plate Floor. 2 1/2" sand concrete topping. Ceiling of 1" vermiculite plaster on metal lath.	4 hrs.	U.S. Bureau of Standards BMS92 Table 44
	As above, except 3/4" vermiculite plaster.	3 hrs.	
	Cellular Steel Floor. Minimum of 2" cinder concrete fill. Suspended ceiling of 7/8" vermiculite plaster on metal lath for protection of cellular steel.	4 hrs.	Underwriters' Lab. Ret. No. 2689-12/18/39
	As above, except 2 1/2" sand-gravel concrete, suspended ceiling of 5/8" vermiculite plaster on metal lath and 1/2" vermiculite acoustical plastic for protection of cellular steel.	4 hrs.	U.L. Ret. No. 2773-11/29/50
	Steel Joist Floor. 2 1/2" sand concrete fill 1" vermiculite plaster on metal lath.	4 hrs.	U.S. Bureau of Standards BMS92 Table 43
	Steel Joist Floor. 2 1/2" sand concrete fill 3/4" vermiculite plaster on metal lath.	3 hrs.	
	Steel "1" Beam Protection. Suspended protection of 1" vermiculite plaster on metal lath. Incombustible construction above ceiling.	4 hrs.	Underwriters' Lab. Ret. No. 2773-1/20/47
	Steel column protected with 1" vermiculite plaster on metal lath. Lath spaced 1 1/4" from column flange. Space behind lath on flange faces filled with plaster as shown.	3 hrs.	Underwriters' Lab. Ret. No. 2851-1/7/47
	Ditto, 1 1/2" vermiculite plaster on metal lath.	4 hrs.	U.L. Ret. No. 2850-5/10/49
	Load-bearing wood stud partition. Metal lath with 3/4" vermiculite plaster both sides.	1 hr.	Underwriters' Lab. Ret. No. 2773-8/31/44

For complete summary of fire tests, send for folder PA-12.

Zonolite vermiculite plaster — fireproofing

fireproofing

For years persons concerned with the problems of protecting steel buildings from fire have attempted to obtain an economical, lightweight, and comparatively thin material that would give as much as 4 hours fire protection. Zonolite vermiculite plaster provides the answer for fireproofing of floors, roofs, columns, beams, trusses and girders. (See summary of fire tests, page 6.)

weight reduction

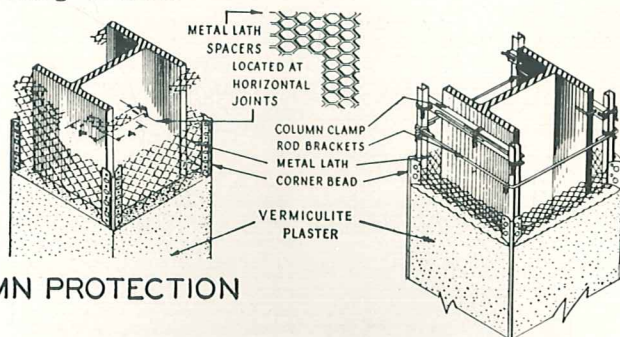
When stone concrete is used to obtain a four hour rating as protection for structural steel beams, the concrete weighs approximately 190 pounds per linear foot for a 15" I beam. This same beam may be protected with one inch of Zonolite plaster on metal lath, in which case the plaster and lath will weigh about 19 pounds, giving a 90 percent reduction in weight for the protection material. One large building, re-designed for Zonolite fire-proofing, effected a weight reduction in the fireproofing materials of over 14 million lbs. (94%).

This saving, coupled with an equally large saving in weight due to the use of Zonolite protection for the cellular steel floor system, resulted in a saving of 1880 tons (30%) of structural steel in the entire building.

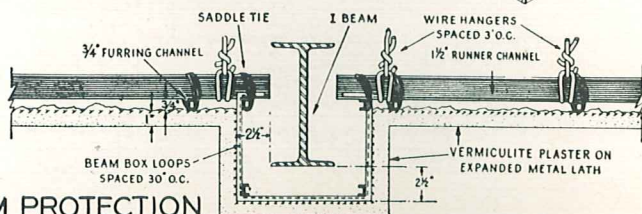
additional savings

Ordinarily, where appearance is important, a plaster finish is necessary on concrete protected construction. Zonolite fireproofing plaster provides both the finished surface, as well as the needed fire protection. The substantial saving possible with Zonolite is self-evident. The total cost, materials and labor for fireproofing by this method about equal the cost of forming alone for poured concrete. Fireproofing with Zonolite plaster eliminates the cost of the concrete, reinforcing, labor of placing, dismantling forms and providing an additional plaster finish.

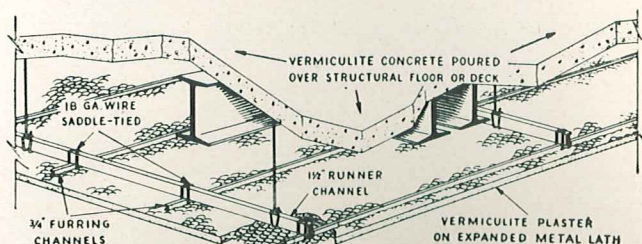
Fireproofing details



COLUMN PROTECTION



BEAM PROTECTION



SUSPENDED BEAM PROTECTION

specifications

mixing instructions

For Two-Coat Work Over Lath—1 bag Zonolite Plaster Aggregate and 1½ to 2 (100 lbs.) bags gypsum neat plaster.

For Three-Coat Work—Scratch coat—1 bag Zonolite Plaster Aggregate and 2 (100 lb.) bags gypsum neat plaster.

Brown Coat—1 bag Zonolite Plaster Aggregate and 1⅓ to 1½ (100 lb.) bags gypsum neat plaster.

For Base-Coat Over Masonry—1 bag Zonolite Plaster Aggregate and 1⅓ to 1½ (100 lb.) bags gypsum neat plaster.

For estimating purposes: 100 sq. yds. of plaster on gypsum lath requires 6 bags of Zonolite vermiculite Plaster Aggregate and 9 bags of gypsum.

general information

minimum thickness of plaster—

Based upon A.S.A. Standard Specifications for Gypsum plastering:

Over metal lath and masonry ⅝"

Over all other laths ½"

(For fireproofing see Summary of Fire Tests on page 6.)

weight of plaster—

Zonolite Plaster Aggregate weighs approximately 8 pounds per cubic foot. On the wall, Zonolite gypsum plaster ½ inch thick weighs about 14 pounds per square yard, as compared to 45 pounds for sand plaster.

gradation of aggregate—

Zonolite Plaster Aggregate is a highly uniform material graded to the standard sizes established in the A.S.A. Standard Specifications for Gypsum Plastering.

finish coat—

Suitable for any standard finish coat, including gypsum-lime putty, Zonolite vermiculite Finish Plaster, sand, Keene's cement, acoustical plasters including Zonolite Acoustical Plastic. The finish coat shall be applied while the base coat is in a "semi-green" condition. If the base coat is too dry it must be evenly wetted but not saturated before the finish coat is applied.

insulation—

K factor Zonolite plaster is .95 as compared to 3.0 for sand plaster. Insulation on walls and ceilings minimizes danger of condensation.

plaster accelerator sometimes desirable

Plaster sand from different localities varies in sharpness and purity and often affects the speed of set of gypsum. Gypsum manufacturers adjust the set to fit local sand conditions by adding varying quantities of retarder. In areas where sand has a strong accelerating effect, gypsum contains a greater amount of retarder.

Zonolite aggregate is pure and has no accelerating effect on gypsum. If strongly retarded gypsum is used with vermiculite, a slow set may be encountered. Ideally, plaster should set in 3 to 6 hours. Delay of setting may cause excessive shrinkage, possibly causing plaster cracking. The remedy for slow setting is to add a small quantity of commercial accelerator to the mix, the amount easily determined on the job.

Zonolite plaster applied by machine

Tests prove Zonolite vermiculite to be the most successful aggregate for plaster machines. Longer hoses can be employed, with much less wear on equipment. Consult the machine manufacturer for details.

Zonolite acoustical plastic

A factory-mixed material that requires only the addition of water, Zonolite Acoustical Plastic is applied by ordinary plastering methods and frequently requires no further decorating.

Zonolite Acoustical Plastic can be applied to any clean, firm, water-resistant surface, even bonding direct to the underside of concrete ceilings. It is ideal for remodeling, since it can be applied over old plaster ceilings without additional furring or lathing, provided the base is firm. Zonolite Acoustical Plastic can also be worked into corners, over curved or ornate surfaces, without cutting or fitting or unsightly joints. It affords the architect and contractor a flexible, versatile material that does not hamper design or application.

fire safe—sound deadening

Like other Zonolite products Zonolite Acoustical Plastic is absolutely fireproof. When applied to combustible surfaces it will reduce the flame spread, contribution of fuel, and production of smoke.

Sound Absorption Test—Coefficient of sound absorption recorded for Zonolite Acoustical Plastic $\frac{1}{2}$ " thick after being painted with 2 and 4 coats of Kem-Tone:

Frequency (cycles per second)	Coefficients 2 coats	Coefficients 4 coats
128 .....	.31	.30
256 .....	.32	.37
512 .....	.52	.59
1024 .....	.81	.84
2048 .....	.88	.74
4096 .....	.84	.65
Noise Reduction Coefficient .....	.65	.65

Meets Federal Specifications SS-A-111, Acoustic Materials, Type II, Classes I and FF.

lowest cost sound-conditioner

On virtually all acoustical jobs, Zonolite Acoustical Plastic proves the lowest cost material to buy, and the most reasonable to apply. This frequently permits sound-conditioning to be installed where it could not otherwise be provided.

mixing and application

One bag of Zonolite Acoustical Plastic will cover approximately 4 square yards $\frac{1}{2}$ " thick. One bag requires 10 gallons of water.

Where damp conditions exist, such as above swimming pools, waterproofing is required. Mix 1 quart of Zonolite Water-

proofing Admix into the water for each bag of Zonolite Acoustical Plastic used.

When applied on new work the base of Zonolite Acoustical Plastic shall be a brown coat of any standard plaster (gypsum or portland cement), or clean concrete slabs.

When applied on old concrete, plaster or masonry surfaces the surfaces must be firm and clean. Zonolite Acoustical Plastic must not be applied over plaster finish coats that are bulging, flaking or separating in any way from the plaster base coat. On new construction, the gypsum plaster base coat should have a thickness of not less than $\frac{1}{2}$ ". Zonolite Acoustical Plastic will adhere to any surface that is unaffected by water, but a base that is free from movement (expansion and contraction) is definitely essential. If there is any doubt about the surface consult the manufacturer.

IMPORTANT: To avoid rust spots, metal tie wires, nails, etc., must be completely covered by the gypsum or cement plaster base coats.

On painted surfaces the paint must be permanently water resistant. Greasy, dusty or calcimined surfaces shall be washed clean before application of Zonolite Acoustical Plastic.

mixing: One bag of Zonolite Acoustical Plastic will require 10 gallons of water. Enough water must be used to obtain a soft plaster consistency. Pour most of the water into a clean mortar box; add the full bag of plastic and mix to uniformity adding enough additional water to obtain the soft consistency necessary for easy application. If Zonolite Waterproofing Admix is to be used it shall be added to the mixing water before adding the plastic.

application: Apply in two coats of $\frac{1}{4}$ " each. The first coat should be left neat under the trowel. Allow first coat to dry thoroughly before applying the finish coat. The second coat shall be smoothed off with an aluminum or smooth wooden darby. Do all finishing while fully wet to the desired texture and allow to dry **WITHOUT ANY FURTHER MANIPULATION.**

A rough texture finish may be obtained by stippling with a rice root brush.

painting: Zonolite Acoustical Plastic dries to an attractive off-white color. If desired it may be sprayed with a coat of water-thinned resin emulsion or casein paint or oil paint.



Leiberman Trunk
Co., Saginaw,
Mich. Frederick
Beckbissinger,
Archit.



Harbor Lights
Cocktail Lounge,
Galesburg, Ill.

Zonolite products are sold by lumber and building material dealers, and are distributed by plants in principal cities. They are readily available to you.